Part I

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OF

Proceedings of the Fifteenth Annual Precise Time and Time Interval (PTTI) Applications and Planning Meeting

A meeting held at the
Naval Research Laboratory
Washington, D.C.
December 6-8, 1983

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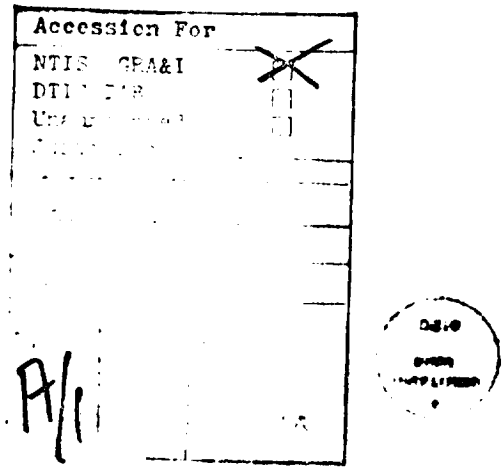

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These proceedings contain the papers presented at the Fifteenth Annual Precise Time and Time Interval (PTTI) Applications and Planning Meeting, including questions and answers following presentations. The purpose of the meeting was to give PTTI managers, systems engineers, and program planners a transparent view of the state of the art, and opportunity to express needs, a view of important future trends, and a review of relevant past accomplishments; to provide PTTI users with new and useful applications, procedures, and techniques; to allow the PTTI researcher to better assess fruitful directions for research efforts.

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SUBJECT: Time Controlled Release of Medication By Implantable Devices

FOREWORD

These proceedings contain the papers presented at the Fifteenth Annual Precise Time and Time Interval Applications and Planning Meeting which was held December 6-8, 1983 at the Naval Research Laboratory. The discussions following the presentations are also included. There were 261 registered attendees, of which 31 were from 13 foreign countries.

The objective of the meeting was to provide an opportunity for program planners to meet those who are engaged in research and development and to keep abreast of the state-of-the-art and latest technological developments. At the same time, it provided an opportunity for the engineers and scientists to meet program planners. This objective is clearly reflected by the title of the meeting.

This year, the program emphasized advances in Time and Frequency Services of the various national laboratories, the use of the NAVSTAR Global Positioning Service for time transfer, and the mathematics and statistical techniques used in PTTI. Specialized PTTI applications and systems for Time Transfer/Synchronization and PTTI System Components were also included in the program. For the second time in the history of the PTTI meetings, a well-attended classified session was held.

The Executive Committee wishes to express its appreciation of the excellent work of the Session Chairman and the Technical Program Committee. The quality of the program remains excellent as is evidenced by the increasing registration and continuing support of our sponsors. The key to the success of a meeting such as this depends on the unstinting support of many volunteers. We are fortunate to have such support from the sponsors. In particular, the efforts of Mesers. S. Clark Wardrip and James Murray must be recognized, as well as the hospitality of the Naval Research Laboratory.

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CALL TO SESSION

Dr. William J. Klepczynski
Program Chairman
United States Naval Observatory

DR. KLEPCZYNSKI: My name is Bill Klepczynski, and I am the program chairman for this meeting. Unfortunately, the general chairman of the meeting, Dr. Nicholas Yannoni, is ill and could not, therefore, make it for today. So, on his behalf, I would like to extend to you a hearty welcome for your attendance here at the Fifteenth Annual P.T.T.I. Meeting.

Authors of papers, Lauren Rueger, who is here, I'll ask him to stand up, he is to receive your paper sometime, during the three days of the meeting, for publication in the Proceedings of the Fifteenth Annual Precision Time and Time Interval Planning Conference.

For our welcoming address I would like to introduce Jim Murray of the Naval Research Laboratory.

WELCOMING ADDRESS

Jim Murray
Naval Research Laboratory

MR. MURRAY: I am sorry that our Commanding Officer, Captain McMorris, will not be able to be here for the welcoming address; but, on his behalf, I would like to extend to you a wish for a very successful meeting.

The laboratory is not new to this meeting. We have been associated with it for the past fifteen years, back to when it first started. During that time we have seen the number of sponsors increase by an order of magnitude; from one to ten, and we have seen the nanosecond replace the microsecond as the most talked about unit of time; and now we can even use picoseconds without a footnote. These are all signs of progress, and these are things that the timing community has done; but there's another sign of progress, and that's the growing number of users that describe their systems in terms of these units. For this, our meetings can take proper credit.

We are responsible for letting the potential users know what has been done, what is being done, and what is planned in timing. In this way, we have helped them to take advantage of the kinds of precise timing that can improve their systems.

P.T.T.I. meetings have been very successful in accomplishing their purposes, and I am sure this meeting will enjoy the same productivity as those in the past.

We have many foreign visitors here and we are very happy to have them. We are sorry for the inconvenience that our entry procedures have caused, but this is just part of our system that we cannot do without.

I welcome you here and I wish you success in your meeting.

OPENING COMMENTS

Dr. William J. Klepczynski
Technical Program Committee
United States Naval Observatory

DR. KLEPCZYNSKI: I would like to talk about the program very briefly. As Jim mentioned, today microsecond timing is available throughout most of the world; and in some instances, we have nanosecond timing. This has really taken place in the last fifteen or sixteen years. I think the first Hewlett-Packard cesium box came out about 1967 or '68, and ever since that time the timing community and users of precise time have made quantum leaps in their systems; and the programs reflect some of these advances.

The first session we have is devoted to advances in the services provided by the various national laboratories.

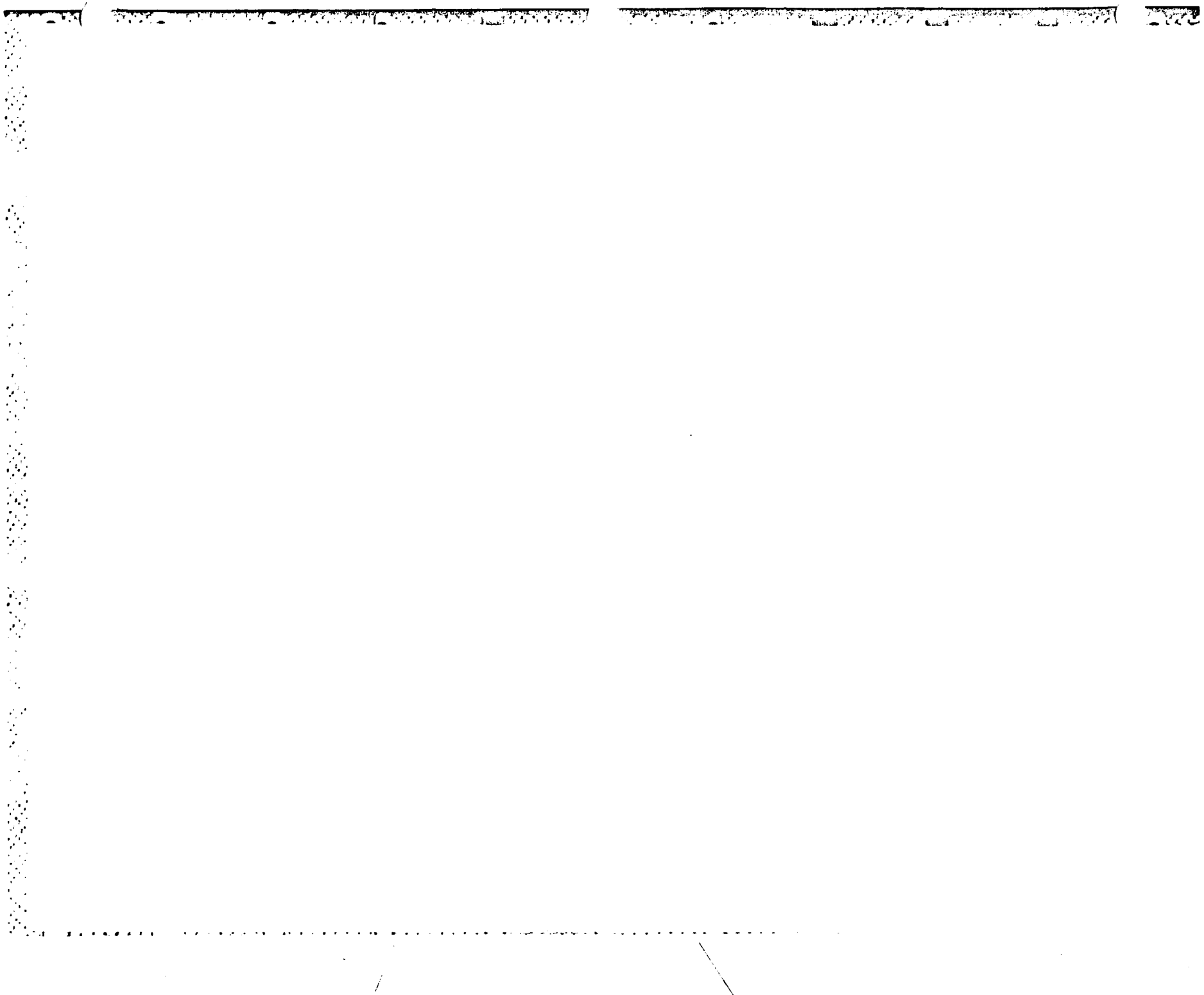
We have another session on G.P.S. time transfer; one of the most up-to-date systems, which will assure nanosecond timing throughout the world.

One session is devoted to the mathematics of precision time and frequency. Since we have not dealt with that for a long time, we thought some interesting tutorials would be worthwhile for the people who attend the meetings.

There is one classified session which will not be held in this auditorium; it will be held in a separate building and is restricted to cleared U.S. citizens. So please take this into consideration.

If you have a question would you identify yourself, because the sessions are being recorded for the proceedings of the conference, and we can then get your name and affiliation as well as your words.

With that, I would like to introduce the chairman of the first session, Dr. Derek Morris, National Research Council of Canada.



SESSION I

ADVANCES IN TIME AND FREQUENCY SERVICES

Dr. Derek Morris, Chairman
National Research Council
Canada

CALL TO SESSION I

DR. DEREK MORRIS: Good morning. This session is called Advances in Time and Frequency Services, and I understand at the moment that five of the six papers will be given. If the authors of the last paper are here, I would appreciate it if they would identify themselves to me; if not, we will start right away, and I would ask the speakers, please, to keep to twenty minutes for their presentations. If it's slightly less than that, we will have time for one or two questions; but we have a deadline to reach lunch by 11:50, so we will have to keep the session moving.